

- NEAL, C. M.; LUSTICK, S. J. (1974): Energetics and evaporative water loss in the short-tailed shrew. *Physiol. Zool.* 47, 180–185.
- PEARSON, O. P. (1947): The rate of metabolism of some small mammals. *Ecology* 28, 127–145.
- (1948): Metabolism of small mammals. *Science* 108, 44.
- PFEIFFER, C. J.; GASS, G. H. (1962): Oxygen consumption in the small short-tailed shrew *Cryptotis parva*. *Trans. Illinois Acad. Sci.* 55, 130–132.
- PLATT, W. J. (1974): Metabolic rates of short-tailed shrews. *Physiol. Zool.* 47, 75–90.
- PUCEK, Z. (1970): Seasonal and age changes in shrews as an adaptive process. *Symp. Zool. Soc. London* 26, 189–207.
- STAHL, W. R. (1965): Organ weights in Primates and other mammals. *Science* 150, 1039–1042.
- VOGEL, P. (1974): Kälteresistenz und reversible Hypothermie der Etruskerspitzmaus *Suncus etruscus*. *Z. Säugetierkunde* 39, 78.
- (1976): Energy Consumption of European and African shrews. *Acta Theriol.* 21, 195–206.
- WAHLSTRÖM, A. (1929): Beiträge zur Biologie von *Crocidura leucodon*. *Z. Säugetierkunde* 4, 157–185.
- WANG, L. C.; HUDSON, J. W. (1971): Temperature regulation in normothermic and hibernating eastern chipmunk *Tamias striatus*. *Comp. Biochem. Physiol.* 38 A, 59–90.
- WEIBEL, E. R.; BURI, P. H.; CLAASEN, H. (1971): The gas exchange apparatus of the smallest mammal *Suncus etruscus*. *Experientia* 27, 724.

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A new species of shrew, genus *Sylvisorex*, from Rwanda and Zaire (Insectivora: Soricidae)

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Abstract

Sylvisorex vulcanorum n. sp. is described from specimens collected recently by members of the University of Antwerpen in the Virunga Mountains National Park and the Nyungwe Forest, Rwanda. A museum record from the Zairese part of the Virunga Mountains is also included. In external appearance, *Sylvisorex vulcanorum* is a smaller version of *Sylvisorex granti*, whereas in cranial characters it resembles the smallest species in the genus, *Sylvisorex johnstoni*. The new species was only found in natural montane environments between 1900 and 3100 m above sea level.

Introduction

The mountains along the central African rift valley from Lake Albert in the north to Lake Tanganyika in the south house a rich vertebrate fauna that includes many endemic species of small mammals. Among the shrews there are about eleven species endemic to this region: *Myosorex blarina* Thomas, 1906, *Myosorex babaulti* Heim de Balsac and Lamotte, 1956, *Myosorex schalleri* Heim de Balsac, 1966, *Sylvisorex granti* Thomas, 1907, *Sylvisorex lunaris* Thomas, 1906, *Sylvisorex suncoides* Osgood, 1936, *Paracrocidura maxima* Heim de Balsac, 1959, *Crocidura niobe* Thomas, 1906, *Crocidura kivuana* Heim de Balsac, 1968, *Crocidura lanosa* Heim de Balsac, 1968 and *Crocidura stenocephala* Heim de Balsac, 1979. To this list we add a new species of *Sylvisorex*. Its description is mainly based on a series of

specimens collected by members of the University of Antwerpen during two expeditions in 1981 and 1982 to Rwanda (See VAN DER STRAETEN and VERHEYEN 1983; BAETEN et al. 1984).

Besides other localities, small mammals were collected in the Virunga Mountains and in the Nyungwe Forest where natural montane environments still exist. Seven tiny black shrews were obtained which could not be identified with one of the known species. A subsequent examination of the collections in the museums of Brussels and Tervuren yielded a further specimen from the Zairese part of the Virunga Mountains.

By describing a new species of shrew we point out that the mammal fauna of the African mountain forests is still insufficiently known, although much of these forests has been cut down and is constantly converted into farmland. Most of the endemic insectivores of these mountains were discovered only within the past thirty years. It is questionable whether the whole diversity of mammals will be known to science before the forests have disappeared.

Material and methods

Specimens cited and illustrated are in the collections of the Koninklijk Museum voor Midden-Africa, Tervuren (KMMAT), the Institut Royal des Sciences Naturelles de Belgique, Bruxelles (IRSNB), Zoologisches Museum der Humboldt-Universität Berlin (ZMB) and Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn (ZFMK). Material from other collections has been also examined and used for comparison. Measurements were taken with a dial caliper graduated to tenths of millimeters. Some of the values for head and body length, tail length, hindfoot length (excluding nails) and ear length are those taken by the collectors but most values were taken from alcohol specimens and dry skins. All measurements are in millimeters, weight in grams.

Results and discussion

Description of *Sylvisorex vulcanorum* n. sp.

Holotype: Adult female preserved in alcohol, skull extracted, both in good condition; collected on 27 July 1982 at Karisoke (0° 28' S, 29° 29' E, 3100 m), Parc National des Volcans, Rwanda, by W. VERHEYEN; original field number 3726; deposited in the Koninklijk Museum voor Midden-Africa, Tervuren.

Paratypes: Six further specimens (five alcohol, one skin, all with skulls) from Rwanda; No. 3703, 3738 from Karisoke (coll. W. VERHEYEN 1982); No. 2335 from Kinigi (01° 27' S, 29° 35' E, 2100 m, coll. W. VERHEYEN 1982); No. 3006 from Visoke (01° 27' S, 29° 30' E, 2700 m, coll. A. WILSON 1982); No. 2063 from Uwinka, Nyungwe Forest (02° 29' S, 29° 12' E, 2450 m, coll. J. HULSELMANS). Specimens are deposited in the Koninklijk Museum voor Midden-Africa, Tervuren, except for No. 3738 which will be deposited in the Museum Alexander Koenig, Bonn. One skin with skull from Zaire, No. IRSNB 4841 from Kibati, Virunga Mountains (01° 37' S, 29° 15' E, 1900 m, coll. G. F. DE WITTE, 15. 1. 1934).

Diagnosis and description: A small, dark-coloured and long-tailed species of *Sylvisorex* (in the sense of THOMAS 1904 and HEIM DE BALSAC and LAMOTTE 1957). Externally similar to *S. granti* but considerably smaller (Fig. 1). Colour of dorsal and ventral pelage blackish-brown, snout, ears, limbs and tail also brown but less dark. Fur dense and soft, individual hairs about 4.5 mm long. Ears well visible from the outside, covered only with very short dark hairs. Muzzle with numerous vibrissae, the longest of which measure 13 mm. Hindfoot 21.2 %, tail 99.7 % of head and body length. Tail without long bristles over its entire length.

Skull short with a round braincase. Dorsal profile of skull slightly domed (Fig. 2). Interorbital constriction relatively broad (24.8 % of condylo-incisive length). Rostrum

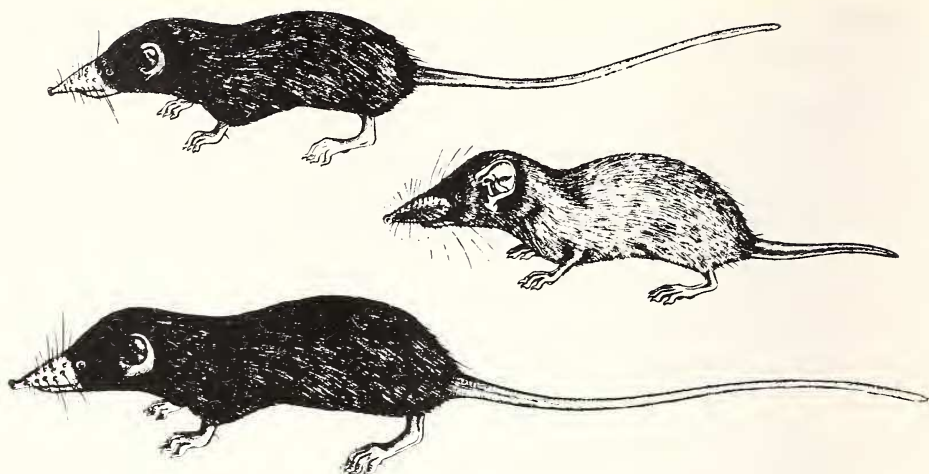


Fig. 1. *Sylvisorex vulcanorum* n. sp. (top) compared to *S. johnstoni* (center) and *S. granti* (bottom). All to same scale. Drawn by KATRIN ECKART and HENRY W. NORMAN (center)

very short, particularly the dentary from I^1 to U^4 . First upper incisor very small, even smaller than in most specimens of *S. johnstoni*. Upper unicuspid teeth also very small and narrow. Parastyle of P^4 small, not large and projecting forward as in *S. granti* (Fig. 2). Third upper molar small (0.60×1.08 mm in the holotype) compared to that of *S. granti* (0.64×1.24 mm in ZFMK 68.541), about intermediate in size between *S. granti* and *S. johnstoni*. Mandible and mandibular teeth similar to *S. granti* but smaller, crowns of lower molars more close together, and talonid of third lower molar more reduced. Measurements: Tables 1 and 2.

Distribution: At present the species is only known from forest regions between 1900 and 3100 m in the Virunga Mountains National Park of Rwanda and Zaire, and from the Nyungwe Forest, southern Rwanda. The single specimen (IRSNB 4841) from Zaire was mentioned by FRECHKOP (1938) as "*Crocidura nanilla*" in his account on the mammals of the Albert National Park (now Parc National des Volcans). The species might also occur

Table 1

Measurements of *Sylvisorex vulcanorum* n. sp.

Specimen-No. Sex and age	3726 ♀ ad	3703 ? ad	3738 ♀ ad	3006 ♀ y	2335 ? y	2063 ? yad	4841 ♀ yad
Weight (g)	3.5	—	3.5	—	—	—	—
Head and body length	47	48	54	50	45	43	56
Tail length	47	47	51	45	39	48	51
Hindfoot length	9.9	10.2	10.7	10.6	9.8	10.9	10.5
Ear length	7	6.5	6.5	—	5.5	6.6	6.3
Condyllo-incisive length	15.8	15.8	15.7	—	—	15.5	16.1
Palatal length	5.9	6.1	6.1	6.3	—	6.4	5.8
Upper toothrow length	6.5	6.5	6.6	6.5	—	6.8	6.8
Interorbital width	3.9	4.1	4.2	3.9	—	4.2	3.9
Zygomatic width	4.9	5.2	5.1	4.8	—	4.9	5.0
Greatest width	7.8	7.9	7.8	8.0	—	7.8	7.7
Postglenoid width	5.3	5.6	5.4	5.2	—	5.2	5.2
Braincase height	4.6	4.4	4.4	—	—	4.2	4.8
Lower toothrow length	6.1	6.1	5.9	6.1	—	6.1	6.1
Height of coronoid process of mandible	3.6	3.7	3.6	3.4	—	3.6	3.7

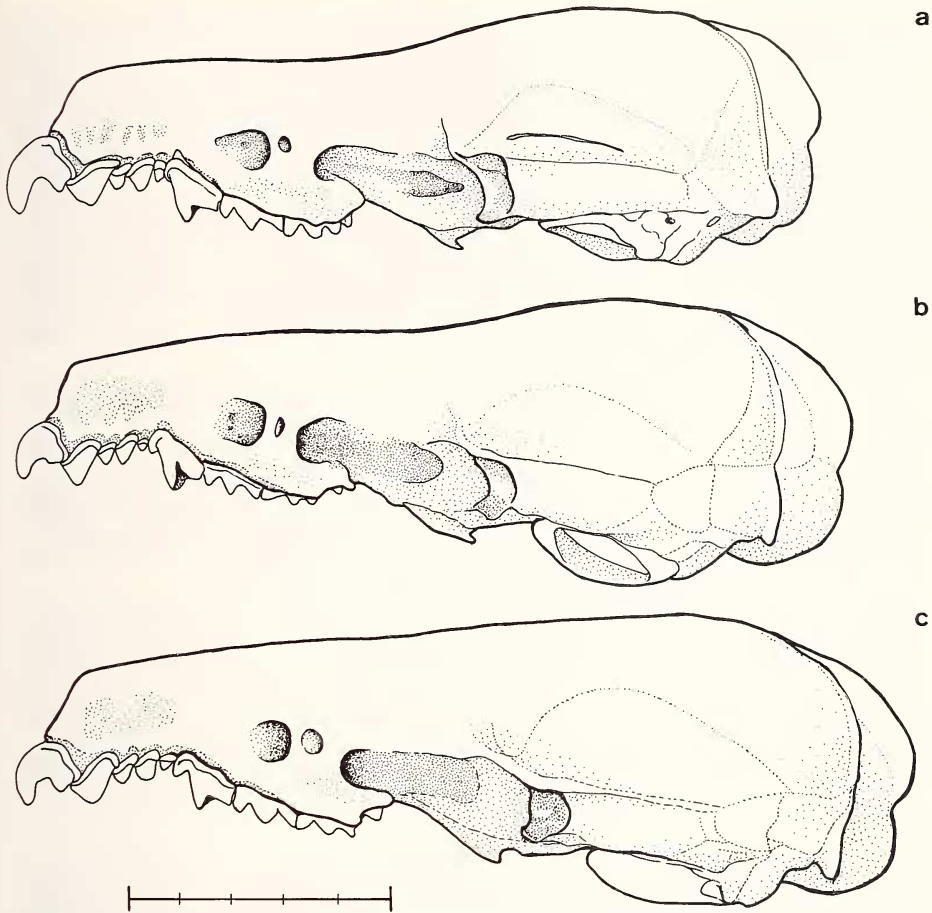


Fig. 2. Crania in lateral view; (a) *Sylvisorex johnstoni* (ZMB 5499 from Bipindi, Cameroon), (b) *Sylvisorex vulcanorum* n. sp. (KMMAT, no 3726, holotype), (c) *Sylvisorex granti* (ZFMK 68.538 from Lwiro, Zaire). Scale is 5 mm. (Drawn by R. HUTTERER)

Table 2

Comparison of mean values of some measurements

Measurement	<i>S. granti</i> (n = 7-11)	<i>S. vulcanorum</i> (n = 5-7)	<i>S. johnstoni</i> (n = 19)
Head and body length	58.0	49.0	45.4
Tail length	55.9	46.9	23.2
Hindfoot length	11.6	10.4	8.3
Ear length	7.5	6.4	5.8
Condyllo-incisive length	16.7	15.8	14.9
Palatal length	6.5	6.1	5.9
Upper toothrow length	7.0	6.6	6.4
Interorbital width	4.2	4.0	3.7
Zygomatic width	5.3	5.0	4.8
Greatest width	8.1	7.8	7.2
Lower toothrow length	6.3	6.1	5.8
Height of coronoid process	3.9	3.6	3.6

on the western side of Lake Kivu, although large collections from the Kivu Mountains have been seen in which no specimens of *Sylvisorex vulcanorum* were found. Etymology: Named for the volcanoes on which the new species lives. Relationships: *Sylvisorex vulcanorum* must only be compared with *S. johnstoni* and *S. granti*. The recently described *S. howelli* (JENKINS 1984), though of similar small size, has the tail partly covered by long bristles and an otherwise different skull and requires therefore no further comment here.

From *S. johnstoni* the new species differs by its longer tail, longer hindfoot and the overall blackish colouration (Fig. 1). The skulls of both are similar but that of *S. vulcanorum* is slightly longer and broader (Table 2). Although its skull is larger, the front teeth of *S. vulcanorum* are smaller than in *S. johnstoni*. *Sylvisorex johnstoni* and *S. vulcanorum* are allopatric and differ also in their ecology. While the former lives in tropical lowland forests (DIETERLEN and HEIM DE BALSAC 1979), the latter only occurs in higher altitudes in primary montane forest regions.

From *S. granti*, the new species differs by a shorter tail, shorter hindfoot, shorter ears, and smaller values for cranial measurements. Most distinctive are the values for condylo-incisive length, upper toothrow length, zygomatic width and height of the coronoid process of the mandible (Table 2). *Sylvisorex granti* and *S. vulcanorum* obviously occur in sympatry, although no definite record of sympatry can be given at the moment. A single specimen of *S. granti* was collected by E. VAN DER STRAETEN during one of the expeditions at Kitabi (02° 33' S, 29° 26' E, 2500 m) on the border of the Nyungwe Forest, Rwanda, indicating that both species live in the Nyungwe Forest.

Within the genus, *Sylvisorex vulcanorum* clearly belongs to the group 2 (*granti*, *megalura*, *johnstoni*) as defined by BUTLER and GREENWOOD (1979) on mandibular characters. The new species shares some characters with *S. granti* (long tail, blackish colouration) and with *S. johnstoni* (small size, short rostrum, rounded braincase, reduction of the talonid of M₃), thus linking the hitherto aberrant *S. johnstoni* with the other species (*granti*, *megalura*) of that group. *Sylvisorex johnstoni* now appears to be nothing else but one extreme (smallest and most short-tailed species) within the radiation of the genus *Sylvisorex*.

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Zusammenfassung

Eine neue Art der Gattung Sylvisorex aus Ruanda und Zaire (Insectivora: Soricidae)

Eine neue Spitzmaus, *Sylvisorex vulcanorum* n. sp., wird anhand von Material beschrieben, das kürzlich von Mitarbeitern der Universität Antwerpen im Virunga Nationalpark und im Nyungwe-Wald in Ruanda gesammelt wurde. In Museumsbeständen wurde außerdem ein Exemplar gefunden, das aus dem zairesischen Teil des Virunga Nationalparks stammt. Äußerlich erscheint *Sylvisorex vulcanorum* wie eine kleine *Sylvisorex granti*, aber in ihren cranialen Merkmalen ähnelt die Art *Sylvisorex johnstoni*, der kleinsten Art der Gattung. Die neue Art wurde nur in natürlichen Berglandschaften zwischen 1900 und 3100 m gefunden und gehört somit zu den Montanendemiten der mittelafrikanischen Gebirgskette.

References

- BAETEN, B.; VAN CAKENBERGHE, V.; DE VREE, F. (1984): An annotated inventory of a collection of bats from Rwanda. *Rev. Zool. afr.* **98**, 183–196.
 BUTLER, P. M.; GREENWOOD, M. (1979): Soricidae (Mammalia) from the Early Pleistocene of Olduvai Gorge, Tanzania. *Zool. J. Linn. Soc.* **67**, 329–379.
 DIETERLEN, F.; HEIM DE BALSAC, H. (1979): Zur Ökologie und Taxonomie der Spitzmäuse (Soricidae) des Kivu-Gebietes. *Säugetierkd. Mitt.* **27**, 241–287.

- FRECHKOP, S. (1938): Mammifères. Exploration du Parc National Albert, Mission G. F. de Witte (1933-1935), Fasc. 10, 103 pp., 19 plates, 1 map. Bruxelles.
- HEIM DE BALSAC, H.; LAMOTTE, M. (1957): Evolution et phylogénie des soricidés africains 2. La lignée *Sylvisorex-Suncus-Crocidura*. *Mammalia* 21, 15-49.
- JENKINS, P. D. (1984): Description of a new species of *Sylvisorex* (Insectivora: Soricidae) from Tanzania. *Bull. Br. Mus. nat. Hist. (Zool.)* 47, 65-76.
- THOMAS, O. (1904): On mammals from the Island of Fernando Po, collected by Mr. E. Seimund. *Proc. zool. Soc., London* 1904 (2), 183-193.
- VAN DER STRAETEN, E.; VERHEYEN, W. N. (1983): Nouvelles captures de *Lophuromys rahmi* et *Delanymys brooksi* en République Rwandaise. *Mammalia* 47, 426-429.

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Organisation spatiale, compétition et dynamique des populations sauvages de Souris (*Mus spretus* Lataste et *Mus musculus domesticus* Ruddy) du Midi de la France

Par J. CASSAING et H. CROSET

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Abstract

*Spatial organization, competition and dynamics of wild mice populations (*Mus spretus* Lataste and *Mus musculus domesticus* Ruddy) in Southern France*

Investigated the spatial organization of wild populations of mice in Southern France, we find that overlap of population distribution does not occur except along a narrow coastal (syntopy). Since direct competition and ecophysiological results cannot account for all aspects of the habitat segregation, we combine demographic data with distribution of individuals and behavioral patterns: major differences become apparent in their spatial and social organization, by establishing a sedentariness index. In densely covered habitats *Mus spretus* males patrol large home ranges within which they are sedentary and territorial. Such a behavior suggests that this species cannot successfully colonize sparsely covered habitats: home range to be controlled becoming then much too large. This situation is present in the dune habitat of the "Petite Camargue", solely inhabited by *M. m. domesticus*. The wandering and nomadic behavior of this latter species enables it to occupy such areas and reconstitute its population after migration due to its social behavior resulting in frequent interindividual contacts.

Introduction

Deux espèces de Souris vivent en sympatrie dans le Sud de la France, l'Espagne et l'Afrique du Nord (BRITTON-DAVIDIAN et THALER 1978): il s'agit de *Mus spretus*, à vie toujours sauvage, et de la semi-espèce occidentale de *Mus musculus*, qui doit être dénommée *Mus musculus domesticus* (THALER et al. 1982), à la fois sauvage et commensale. Dans le Midi de la France, des populations sauvages des deux espèces coexistent en syntopie sur une frange littorale peu étendue; *M. m. domesticus* est exclu des zones arides, comme les garrigues à chêne-kermès, occupées seulement par *Mus spretus* dont les exigences hydriques sont moindres (SICARD et al. 1985). En revanche, l'absence de *Mus spretus* de certaines zones littorales occupées par *M. m. domesticus* ne peut être expliquée par la compétition directe: des confrontations dyadiques réalisées en terrarium (CASSAING 1984) révèlent la supériorité